



ORAU agrees with the general approach described in the Work Plan to determine whether current sites conditions are compliant with the remedial action objective (RAO) in the Parcel G Record of Decision (ROD) (Navy 2009). A summary of general comments is provided below. Specific technical comments for consideration are provided in the attached table.

1. The Work Plan does not define how the field instrument minimum detectable concentrations will be calculated in order to ensure individual measurements/locations exceeding the remediation goals (RGs) can be detected.
 - a. The RGs of 1.0 pCi/g of Ra-226 and 0.113 pCi/g of Cs-137 are in the range of typical background concentrations in soils and, therefore, may not be detectable with typical radiation field detection instrumentation. Typically sites establish both an average and allowable hot spot release criteria.
 - b. Some cited detector efficiencies appear to either be over-estimated (0.90 for Sr/Y-90 for the SCM) or under-estimated (Ra-226 efficiency for the SCM). The approach cited in ISO-7503 is recommended to determine the total efficiency for all field detection systems.
2. The Work Plan does not provide the basis for the proposed 18 systematic sample population.
3. Because the RGs are very low (refer to item 1.a), a statistical comparison with an appropriate background population is needed. ORAU recommends that all the data from the background reference areas be combined and evaluated to determine a reasonable background threshold value (BTV) based on an appropriate UTL of the combined background data (for both surface and subsurface soils).



INDEPENDENT REVIEW OF THE
DRAFT PARCEL G REMOVAL SITE EVALUATION WORK PLAN
FORMER HUNTERS POINT NAVAL SHIPYARD
SAN FRANCISCO, CALIFORNIA

General Comment: Overall, the plan provides adequate detail, includes necessary components of the further investigations planned at the site, and appears to have incorporated or otherwise accounted for a number of technical team and/or regulator comments provided on the February 2018 draft *Work Plan, Radiological Survey and Sampling*. Comments and/or requests for further clarification are documented below. The associated comments in the following section-specific comment matrix are designated as **Significant** if ORAU identified technical deficiencies, simply as **Comment** for technical improvement or clarity, or as a **Minor Comment** when more editorial in nature.

Independent Review Comments				
Section	Page	Paragraph	Applicable Text	Comment/Observation and Recommendation
3.1	3-2	1 st	<i>For that specific sample, the ^{238}U alpha spectrometry result will be used as a more representative estimate of the background value for ^{226}Ra, and the alpha spectrometry comparable result for ^{226}Ra will be compared to the RG for ^{226}Ra using the revised background value.</i>	Comment: As this plan will likely be of interest to the public stakeholders, please consider providing additional clarifying information as to the basis why the U-238 analytical result may be more representative of the expected Ra-226 background concentration. The information was noted to have been provided in Section 5.4, page 5-5. Recommend the applicable discussion regarding the expected equilibrium between U-238 and other radionuclides in the decay series, including Ra-226, be moved and included with the applicable text. Alternatively, refer the reader to Section 5.4 for the information.
3.1	3-2	1 st	<i>If any ^{226}Ra gamma spectroscopy concentration is greater than the RG for ^{226}Ra, then the soil sample will be analyzed for ^{238}U and ^{226}Ra using comparable analytical methods (e.g., alpha spectrometry for ^{238}U and radon emanation for ^{226}Ra).</i>	Comment: Two comments are provided: 1) Recommend stating the Ra-226 by gamma spectroscopy will be evaluated using the photopeak of a daughter of Ra-226 (either Bi-214 or Pb-214) once equilibrium has been established. Note: The comparable information is provided in Appendix A, Section 3.1.7 but is lacking throughout Section 3 of the main body of the Work Plan, notably Section 3.7 Radiological Laboratory Analysis. 2) Recommend adding that another comparable analytical method for Ra-226 is using alpha spectrometry (not just emanation of Ra-226).

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				Alpha spectrometry for Ra-226 is a direct detection method and does not use a daughter product to quantify the Ra-226.		
3.3.1	3-3	3 rd	For gamma scan survey measurements collected, individual measurement results above the RGs will prompt investigations that may result in the collection of bias samples or additional field measurements to determine the areal extent of the elevated activity.	Significant Comment: The statement, as written, indicates that there is a gamma cpm that equates to the RGs, i.e., a cpm to pCi/g correlation. Was the intent to indicate gamma measurements that exceed a count per minute investigation level or is the statement indicating that the gamma scan data will be reported in units of pCi/g based on the planned deployment of the Osprey® digital MCA? Extensive independent verification experience at sites with Ra-226 as the radionuclide of concern has found that site reliance on a gamma cpm to activity concentration correlation results in extensive false negative results, such that the sites were found to not satisfy release criteria. Furthermore, consider revising this general statement to reflect Table 3-6, which indicates only the RG for Ra-226 is applicable, and discuss how the lack of sensitivity for Cs-137 at the RG will be addressed in the survey design and implementation.		
3.3.1	3-3	NA	Table 3-6	Significant Comment: Two comments are provided: 1) The plan should include the technical basis and measurement conditions under which the 1.0 pCi/g Ra-226 investigation level is achievable, as the value may be overly optimistic. As a comparison and to mimic varying observation intervals of an anomaly, laboratory gamma spectroscopy analysis MDCs for Bi-214 were generated and shown in Attachment A for various count times. These results indicate that under optimal laboratory conditions, achieving detection sensitivity of ~1 pCi/g above background requires a count time in excess of 60 seconds. To achieve this observation interval, one must assume that any contamination at or above the RG is widely distributed over the survey unit and confined to upper few centimeters of soil.		
			<table><tr><th>Radionuclide</th><th>Flag Scan Measurement When:</th><th>Investigation Level (pCi/g)</th></tr><tr><td>²²⁶Ra</td><td>100% of RG</td><td>1.0</td></tr></table>		Radionuclide	Flag Scan Measurement When:
Radionuclide	Flag Scan Measurement When:	Investigation Level (pCi/g)				
²²⁶ Ra	100% of RG	1.0				

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				<p>Is the reported level a nominal concentration based on some assumed background, observation interval (i.e., count time of the measurement system based on an assumed area of concern and scan speed)? The Work Plan should include additional information that would substantiate the stated investigation level performance.</p> <p>2) Is there a relationship between the tabulated investigation level and the MDC and MDCR discussions provided in Sections 3.5.2.1 Gamma Surface Activity and 3.5.2.2 Gamma Scan Minimum Detectable Concentration? That is, was the investigation level derived based on factors discussed in the latter sections or a different method?</p>
3.5.2.2	3-9	1 st	<i>Using the preferred strategy to over-excavate trenches may eliminate the requirement for a surveyor to make decisions in real time.</i>	<p>Significant Comment: Please clarify the relationship between over-excavation and a surveyor pausing and deciding whether to mark a location for further investigation? The intent of this statement is unclear, based on the preceding and following narrative, if the topic being discussed is somehow related to whether the surveyor efficiency should be included in the MDCR derivation illustrated in Equation 3-1 on page 3-10. (Note: in discussions of surveyor efficiency, p, in later Work Plan sections for the building investigation design, Section 4.5.7.4 sets $p = 1$ for motor controlled detectors). Section 3.5.2 as a whole is not sufficient and very non-specific as to parameters that will be used to determine scan detection sensitivity, other than the d' specified as 3.28.</p>
3.5.2.1, 3.5.2.2, and 3.6.5	3-9, 3-10	All, and Eq. 3-3	<i>All</i>	<p>Significant Comment: Please clarify within the work plan whether the equations (and methodology in general) presented are related to the Section 3.3.1 Investigation Levels and related comments above. It is not clear what the gamma radiation scan performance requirements are based upon. Section 3.6.5 indicates a combination of post-processed geo-referenced count data and individual radionuclide spectral data measurements will be used to identify areas for further investigations. How are these related to the MDCR determination discussed in this</p>

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				<p>section? What are the anticipated performance goals, relative to the RGs, of the scanning systems? This is particularly relevant for identifying potential Cs-137 contamination, which is indicated as “Not Applicable” in Table 3.6 and has not been further addressed.</p> <p>Most discussions and Equations 3-1 through 3-3 are based on methodology described in NUREG-1507 that was formulated to describe scan decision making performance via detector audio response and allowance for second-stage scanning. The work plan does not clearly indicate if p is planned to be set equal to 1 or a lesser value. Reliance on post-processed data does not necessarily equate to the ideal observer that is assumed when $p = 1$. In other words, what is the lower concentration bound that will be confidently identified from the scanning data assessment? Furthermore, is human performance a factor in the interpretation of geo-referenced data and the decision process for identifying anomalies? ORAU studies have shown there is a positive correlation between a GIS analyst’s true positive anomaly identification using post-processed electronic data in combination with surveyors listening to the audio detector response and pausing at suspect locations, shown in Attachment 2. There are several reasons for the correlation; one of which is the allowance for the detector output to reach full scale when the surveyor pauses near an anomaly, which is then reflected in the electronically captured data that are later evaluated.</p> <p>Additional details for the performance levels should be provided in the Work Plan, although the document states the following:</p> <p style="padding-left: 40px;"><i>“Before deployment at HPNS, instrument-specific SOPs will be provided along with Field Instructions documenting operation and use of the selected instrumentation.”</i></p>

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3.5.3, 4.4.5	3-10	1 st	<i>Portable survey instruments will be calibrated annually at a minimum, in accordance with American National Standards Institute (ANSI) N323a-1997 Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments (ANSI N323) (ANSI, 1997), or an applicable later version.</i>	Comment: Although the text states “ <i>an applicable later version</i> ,” ANSI N323a-1997 has been revised and re-designated as ANSI N323AB-2013. Recommend updating calibration and performance requirements in Section 3.5.3, 4.4.5 and elsewhere in the Work Plan such as SOPs RP-108 and RP-109—references the 1978 version—to the current standard.
3.6.4	3-18	3 rd	<i>Cores less than 4 feet bgs will have samples collected from the top foot and bottom foot of the core. <u>No scans of the core are required.</u></i>	Minor comment: Why are scans of these shallower cores not required? Is there a basis that the 1- to 3-foot soil depth interval would be represented by the top and bottom foot samples? For consistency and to eliminate perceived or actual data gaps, recommend the plan include the requirement to scan all cores.
3.6.5	3-19	2 nd	<i>One hundred percent of the accessible surface of the Phase 1 SUs will be gamma scan surveyed...</i>	Minor comment: Are there any estimates of the percent of the SUs that are not accessible? What are the plans, if any, for addressing inaccessible surfaces, also what constitutes “inaccessible”? Recommend including additional information in the work plan to minimize potential stakeholder concerns for inaccessible areas.
3.6.5	3-19	4 th	<i>Elevated areas will be noted on a survey map (if applicable) and flagged in the field for verification.</i>	Minor comment: Related to prior comments on scanning procedures/methods: does this statement reflect that surveyors will be listening to the audio detector output and flagging suspect anomalies in real-time or is the intent that electronically captured data will be reviewed to select locations that should be “flagged” and further investigated?
3.7	3-21	3 rd	<i>Analyses using alpha spectrometry for ²³⁸U along with an analytical method for ²²⁶Ra comparable with alpha spectrometry for ²³⁸U will be performed in accordance with the SAP.</i>	Minor Comment: The text suggests that a method that is comparable to alpha spectrometry may be used for Ra-226 analysis. However, alpha spectrometry, itself, may also be used for Ra-226 analyses. Suggest editing text to indicate that either alpha spectrometry may (or must) be used for Ra-226 or a similar method to alpha spectrometry.

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3.7	3-22	3 rd	<i>All laboratory data packages will have independent data verification and data validation performed to demonstrate that the data meet the project objectives.</i>	Comment: Because data integrity has been a primary concern with the previous site investigations, recommend that a more robust discussion of the requirements for V&V be provided. Who will perform the V&V and to what standard?
4.5.4	4-4	NA	Table 4-3	<p>Significant Comment: Acknowledging that the tabulated parameters will be updated for the actual instrumentation used, several comments are listed below regarding the tabulated values presented in this draft plan:</p> <p>1) Some of the nominal efficiencies presented are potentially problematic—both under- and more importantly, over-estimating detection efficiency—if similar values are used during the investigation.</p> <p>Relative to the stated efficiencies, a suspected over-estimate is the 0.90 Sr/Y-90 efficiency presented for the SCM, which is more than 4× a more realistic total efficiency of 0.25 to 0.35 expected for common scintillation or gas proportional detectors. Is the 0.90 an accurate representation of the SCM's sensitivity?</p> <p>Conversely, the Ra-226 efficiency for the SCM is potentially conservative and may not account for the multiple alpha emissions from Ra-226 and progeny. Alternatively, was an assumption made that all progeny are lost with Rn-222 emanation and that only the Ra-226 alpha emissions will be measured?</p> <p>2) Furthermore, additional information should be provided on efficiency determination methods in order to assess the stated values. The efficiencies are stated as 4π value. It is unclear if the 4π values represent a total efficiency generated in accordance with the ISO-7503 guidance, and adopted in NUREG-1507, whereby the 2π instrument efficiency is modified for surface effects using an appropriate surface efficiency</p>

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				<p>factor. The Work Plan should provide the method used to generate efficiencies.</p> <p>3) Cs-137 efficiency is not provided, other than for the Model 3030 smear counter. Is the reader to assume that one of the other stated efficiencies, such as Tc-99, will be used to represent the efficiency for Cs-137 beta emissions or otherwise assume all beta contamination is due to Sr/Y-90 and data will be compared against the 1,000 dpm/100 cm² RG presented in Table 4-2? Please provide additional clarification as to how efficiency will be determined, under what conditions will a specific efficiency be used in the quantifying surface activity levels, and describe how the various surface RGs will be compared against survey results.</p>
4.5.7.2	4-7	NA	<i>Table 4-4 Investigation Levels</i>	<p>Significant comment: As stated above, the reviewer understands that the tabulated parameters will be updated for the actual instrumentation used. However, several comments are presented regarding the tabulated values. These are:</p> <p>1) Why are the Investigation Levels (ILs) stated as gross vs. net counts? As detector performance and area background will vary, the recommendation is that ILs be provided as the net counts above background. Additionally, will each detector have independent ILs calculated based on efficiency or other factors or will a single value be used for all similar detector types. If the latter, how will the single value be selected, i.e., an average, the lowest, etc.?</p> <p>2) The table may misrepresent values—recognizing the ILs are given as examples—however, there are multiple ILs that are likely in error that could be propagated into the final plan. The following were noted:</p> <p>a. The RSCS SCM ILs \approx RGs + BKG? All the beta ILs appear to assume approximately 100% detector count to disintegration efficiency, likely an artifact of the 0.90 Sr-90 efficiency listed in Table 4-3.</p>

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				<p>b. The Cs-137 and Co-60 ILs are identical for both the SCM and 43-37. However, detector efficiency for the lower energy Co-60 beta emissions will be lower—as much as much as $\frac{1}{2}$—than the Cs-137 efficiency. Additionally, it appeared that the Sr/Y-90 efficiency was also assumed in the IL calculation for these radionuclides for the SCM, which is not a representative calibration source for these radionuclides and overestimates detection efficiency.</p> <p>The inaccuracies are such that the tables should be deleted or significantly revised.</p>
4.5.7.4	4-9	NA	<i>Example: Beta Scan MDC Calculation for the RSCS SCM and Table 4-6</i>	<p>Significant comment: Prior comments regarding the use of potentially over-estimated efficiencies and calibration standards that do not represent the contaminants of concern beta energies are applicable to the minimum detectable concentrations presented in the example and table. The table and example should be revised using realistic parameters.</p>
4.5.7.5	4-10	NA	<i>Table 4-7</i>	<p>Significant comment: See prior comments—the values provided for investigation levels are not realistic. Action levels are expected to be a fraction of those listed.</p>
4.5.7.7	4-12	NA	<i>Table 4-8</i>	<p>Significant comment: See prior comments—the values provided for static minimum detectable concentrations are not realistic. Actual MDCs are likely to be several times greater than those listed.</p>
5.2.2	5-2	1 st	<i>The preliminary data review will include ... and preparing retrospective power curves</i>	<p>Significant Comment: As there are no formal hypothesis tests discussed in the Work Plan with the exception of those associated with background data assessments in Appendix A, what is the objective of preparing a retrospective power curve? The benefit of the retrospective assessment is to evaluate the probability that Type II error occurred due to an inadequate sample population. For example, using the MARSSIM framework, Scenario A (H_0: decision unit exceeds the release criteria). The site would be concerned with the Type II error, e.g., not releasing a</p>

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				<p>clean unit. There is no effect to the Type I regulator error of concern. However, under Scenario B where H_0: assumes the decision satisfies the release criteria, a retrospective assessment is paramount to assess the probability of a Type II error and provide regulatory assurance that the investigation area is clean, i.e., \leqbackground.</p> <p>The sample population size for this work plan simply references a “previously established protocol (Ttec, 2012)” rather than providing a decision basis requirement for the 18 samples planned from survey units. The referenced protocol was reviewed and reflected the MARSSIM-based methods for planning for the WRS test.</p> <p>Note: Within the regulator comments on the February 2018 draft <i>Work Plan, Radiological Survey and Sampling</i>, specifically the file named <i>EPA Comments on HP Rad Work Plan 3.26.18.pdf</i>, extensive attention was given to the proposed 18-sample location population. Within those comments, various iterations were performed based on prior reference area background and site area population uncertainty with an output of 25 sample locations requested for each SU and background reference area. Additionally, within the file, multiple comments discussed applying the WRS test in combination with a sample-by-sample comparison to the ROD-specified release limits and requested that the WRS test be included in future reports.</p> <p>In the Parcel G Work Plan, the number of samples does not appear to be based on a specific study requirement. Responses to comments on the February 2018 draft <i>Work Plan, Radiological Survey and Sampling</i> that were provided in the electronic file named <i>RTC_Regulators.pdf</i> did not specifically address the basis for the 18 samples or address the regulators request and regulator acceptance that the WRS test would be appropriate, together with the sample-by-sample comparison to the RGs and ultimately the background parameters. Instead, the comment</p>

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				<p>responses refer to the purpose of the work plan being revised to evaluate compliance with the Parcel G ROD. Within the ROD, general terminology is used, such as: remediate and survey soils to ensure remediation objectives/goals are met; rather than providing specifics as to how achieving the stated goal is demonstrated.</p> <p>Therefore, without recognizing stakeholder consensus on what constitutes successfully demonstrating the stated remedial action objective: “Prevent of exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways”—i.e., applying the WRS test, rejecting the null hypothesis, and evaluating individual samples that exceed the RGs with the background parameters (analogous to the elevated measurement comparison described in MARSSIM)—an independent evaluation and conclusion cannot be provided for the proposed survey unit and reference background area sample populations. Overall, the combined number of background samples is likely adequate in combination for estimating background ranges, population and spatial variability, means/medians, and confidence intervals for comparison with survey unit data. However, if each survey unit is a decision unit, the 18 samples may not be adequate unless the data quality assessment includes the evaluation of the individual survey unit mean/median via the WRS test and again emphasizing that increasing the sample size would only impact, lessen, the probability of a Type II error.</p> <p>The stated ROD remediation objective to remediate/survey soils to ensure the RGs are satisfied could not be economically demonstrated for both 100% of the soils with 100% confidence, although perhaps an argument could be made provided that 100% of the soils could be successfully scanned and assurance that the detection sensitivity was a fraction of the RGs. The stated objective could be demonstrated that a specified percent of the decision unit is less than the RGs at a desired</p>

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				<p>confidence level. If that were the case, then the use of an upper tolerance limit (UTL) may be applicable to the decision of contaminated areas above the RGs vs. not contaminated. Eighteen samples provides 60% confidence that at least 95% of any other location that could potentially be sampled will be less than the RGs if the calculated UTL is less than the RGs. Achieving 95% confidence, would require approximately 60 to 450 samples, dependent upon the assumed underlying population distribution, variance, decision confidence, and desired proportion of the population that must be less than the RGs.</p> <p>There are two conceivable alternatives whereby the proposed 18 sample locations would be satisfactory. 1) Applying the WRS test to assess the survey unit mean/median against the adjusted reference background area data and 2) combining survey unit results and assessing the UTLs against the RGs for the various Parcel G Phase 1 and 2 strata in their decision units. Example: excavated soil from 21 TUs \times 18 samples each = 378 samples provides 100% confidence that at least 95% of the values in the population are less than the RGs and the decision unit (the combined Phase 1 TUs) is uncontaminated.</p>
5.2.3	5-3	2 nd	<i>The TU/SU data are compared with the RBA data to demonstrate whether the SU is consistent with the background data. If the SU data are consistent with the RBA data, the TU/SU is considered consistent with background.</i>	<p>Comment: Comment is related to the utility of assessing retrospective power and ultimately providing guidance on sample size which may be a point of contention as to what size is adequate. The plan might consider another objective SU to Background statistical comparison based on hypothesis testing, in lieu of the WRS test, that combines appropriate methods for sample size determination and retrospective analysis, with the following null (H_0) and alternative (H_A) hypotheses:</p> <p>H_0: SU ROC concentrations are \leq background ROC concentrations</p> <p>H_A: SU ROC concentrations are $>$ background ROC concentrations</p>

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				<p>Provided H_0 is not rejected, individual sample results could then be compared to an agreed upon background threshold value (BTV). Consideration for the application of BTVs for individual measurement comparisons was also noted in regulator comments provided for the February 2018 draft <i>Work Plan, Radiological Survey and Sampling</i>.</p>
5.4	5-5	3 rd	<i>Alpha spectrometry provides ^{238}U analytical results of acceptable quality for the NORM evaluation.</i>	<p>Comment: Alpha spectrometry does provide excellent results for U-238. However, the initial NORM evaluation would be much easier, faster, and less expensive if gamma spectroscopy was used to evaluate the U-238 concentrations using the 63 keV peak. This way, the gamma spectroscopy of both the U-238 and Ra-226 could be initially evaluated to determine if the two results are statistically different or equivalent. Additionally, this would eliminate potential sampling error resulting from having a large-sized sample for gamma spectroscopy from which a small aliquot is removed for alpha spectrometry.</p> <p>If, after comparing the U-238 and Ra-226 results from gamma spectroscopy, the results are not statistically different, then the alpha spectrometry for U-238 and Ra-226 would then be performed.</p>
5.5	5-6	Eq. 5-1	<i>NA</i>	<p>Comment: Equation 5-1 appears to be a version of the duplicate error ratio calculation for assessing the precision of duplicate measurements of the same sample. Is this an appropriate method for evaluating independent, uncorrelated samples?</p>
App. A, 3.1.3	3-2	1 st	<i>In order to simplify the sampling design, an approximately 20-foot by 20-foot square has been established within each of the four historical RBA footprints.</i>	<p>Comment: Will the small area of the RBAs provide adequate representation of the localized background spatial variability? Recommend enlarging the RBA areas if readily achievable.</p>

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App. A, 3.1.3	3-3	1 st and 2 nd	<i>The land area near the radio station building and transmitter has remained undisturbed since 1937 and has been selected as the location of the offsite RBA (RBA-Bayview). Both surface gamma scan surveys and surface soil samples will be collected from RBA-Bayview to provide a more accurate surface soil data set to represent undisturbed surface soil areas. <u>Based on field conditions, additional sample locations at Bayview Park or other reference areas may be added as necessary to characterize different soil types and depositional areas.</u></i>	Comment: Similar to the on-site RBAs, recommend that if a larger portion of the park is accessible for the background study, that sample locations be distributed quasi-randomly, to minimize spatial clustering, over the park. Recognizing that regulator comments on the previous draft work plan requested that background samples not be collected at locations at the bottom of slopes where runoff could have deposited sediment and led to accumulation of Cs-137, is it representative of potential site background conditions to exclude the lower terrain if similar fallout accumulation points exist in the study areas?
App. A, 3.1.7	3-6	Table 3-6	<i>²³⁸U Series (²³⁸U via protactinium-234m, ²¹⁴Pb, ²¹⁴Bi)</i>	Comment: The low abundance of the 1001 keV protactinium-234m photopeak may be problematic for achieving adequate quantification of U-238 at background levels. Consider replacing via the 63 and 93 keV Th-234 photopeaks to quantify U-238 for gamma spectroscopy as discussed in prior Section 5.4 comment above.
App. A, 4.2.2	4-3	Last	<i>Confirmed outliers will be removed from individual data sets</i>	<p>Comment: Consider revising the applicable text statement regarding outliers. Section 4.4 of EPA 5QA/G-9 provides the following guidance:</p> <p>Section 4.4 OUTLIERS: ...One should never discard an outlier based solely on a statistical test. Instead, the decision to discard an outlier should be based on some scientific or quality assurance basis. Discarding an outlier from a data set should be done with extreme caution, particularly for environmental data sets, which often contain legitimate extreme values. If an outlier is discarded from the data set, all statistical analysis of the data should be applied to both the full and truncated data set so that the effect of discarding observations may be assessed. If scientific reasoning does not explain the outlier, it should not be discarded from the data set...</p> <p>Consider performing the assessment both with and without outliers to determine if the decision changes between the two scenarios.</p>

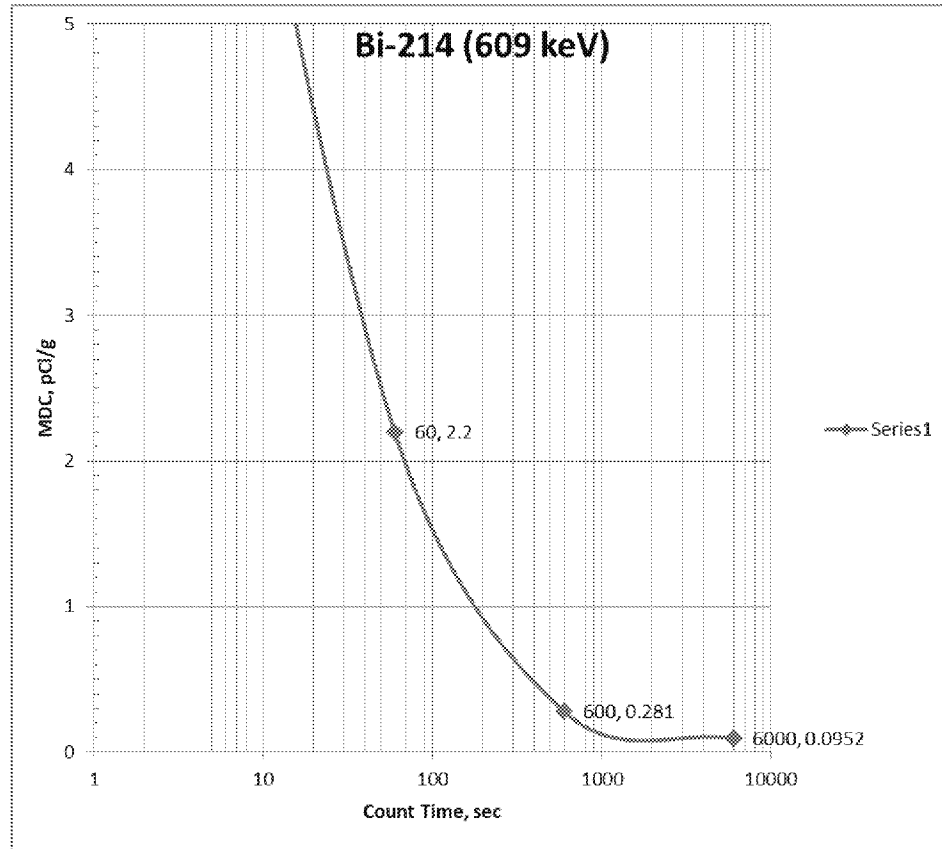
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App. A, 4.2.3	4.4	3 rd	<i>The RBA data sets will be compared...as described in Section 4.1.3, to determine whether the reference areas have similar or significantly different background levels. If there are data sets that are similar (i.e., pass the KW test), they may be combined. If data sets are significantly different (i.e., they fail the KW test), further evaluation will be performed to determine the potential causes of the differences such as soil type or depth bgs. Data may be plotted on site maps or plotted against gamma-scan data to look for visual clues as to ROC distribution and to evaluate spatial independence.</i>	Comment: Please provide additional information on how the various backgrounds will be further assessed should the K-W test reject the null hypothesis that the backgrounds are from the same population. The K-W will not determine which population is different, only that there is a difference. Is the intent to perform the test on different combinations?
4.5.7.4 App. B RP-106	Table 4-6 Page 1 of 7		Page: 1 of 6 RRP-106	Minor comment: Change to Page: 1 of 7 as there are 7 pages in the procedure. Minor comment: Change footer from RRP-106 to RP-106.
App. B RP-106	Page 2 of 7	5.2	5.2 Radiation Protection Technician (RPT) <input type="checkbox"/> RPTs are responsible for documenting surveys in a legible manner on approved forms.	Comment: Consider briefly describing how the survey should be documented here beyond documenting legibly. May point to section 10.1.
App. B RP-106	Page 3 of 7	7.0	7.0 PRECAUTIONS AND LIMITATIONS <input type="checkbox"/> Surveys for airborne radioactivity will be documented in accordance with RP-107, "Measurement of Airborne Radioactivity."	Comment: Because air samples are excluded from this procedure, consider noting that in 7.0. For example, for clarity, consider adding in the Italicized text: "Surveys for airborne activity <i>are not covered in this procedure and</i> will be documented in accordance with ..."
App. B RP-106	Page 3 of 7	9.0	9.0 RECORDS <input type="checkbox"/> PESI Survey Form (Attachment 1) <input type="checkbox"/> PESI Survey Log Number Form (Attachment 2) <input type="checkbox"/> Radiation Protection Technician (RPT) Logbooks	Comment: Section 10.2.4 mentions count room printouts. Suggest adding a bullet to include other potential records to section 9.0.

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App. B RP-106	Page 3 of 7	10.1, step 5	5. Assign the next sequential survey number to the survey from the survey number logbook.	Minor Comment: Section 10.1.2 calls the document the survey log number book. Make consistent to minimize confusion.
App. B RP-106	Page 3 of 7	10.1.1, step 6	6. Complete the following information for all surveys: <input type="checkbox"/> Date and time of survey <input type="checkbox"/> Location of survey <input type="checkbox"/> Instrument type and serial numbers and associated supporting information (i.e., detector efficiencies, calibration dates, background values, etc.) <input type="checkbox"/> HWP number, if applicable <input type="checkbox"/> Reason for survey	Comment: Consider clarifying the first bullet so that it specifies (start and stop time). Minor Comment: Spell out HWP. Comment: Suggest adding another bullet to encourage additional details, such as adding in project-related activities or conditions of significance (e.g., weather extremes); also, sufficient detail to enable independent reconstruction of the work activities and records.
App. B RP-106	Page 4 of 7	10.1.1, step 7	7. Indicate Radiological Hazard Area boundaries on the survey form using x's and -'s (-x-x or **).	Comment: Radiological Hazard Area is not defined in the definitions section.
App. B RP-106	Page 4 of 7	10.1.1, step 8	8. Note the posted Radiological Hazard using common designator such as <input type="checkbox"/> Contamination Area = CA <input type="checkbox"/> Radiation Area = RA <input type="checkbox"/> Radioactive Material Area = RMA <input type="checkbox"/> Airborne Radioactivity = ARA	Comment: Because this procedure does not cover air sampling, should the last bullet be removed? If it should stay, "Area" should be added (Airborne Radioactivity Area = ARA).

Attachment 1

Bi-214 (609 keV)

Count Time, sec	MDC, pCi/g
1	14.3
6	7.61
60	2.2
600	0.281
6000	0.0952



Attachment 2

Land Surveys Without Headphones

Surveyor No.	Survey Duration (min)	Percent ^a Coverage	Per Surveyor			Per GIS Technician		
			No. Misses	No. Found	False Positives	No. Misses	No. Found	False Positives
1	23	78	2	8	0	2	8	0
2	22	72	3	7	0	0	10	0
3	42	89	0	10	0	0	10	0
4	33	72	0	10	0	0	10	0
5	16	61	4	6	0	4	6	0
6	20	83	0	10	0	0	10	0
7	30	61	3	7	0	2	8	0
8	20	67	3	7	0	2	8	0
9	20	83	0	10	1	0	10	0
10	32	89	1	9	0	0	10	1
Sums:	NA	NA	16	84	1	10	90	1
Averages:	26	76	1.6	8.4	0.1	1.0	9.0	0.1

^aPercent coverage generally based on the number of parallel survey lanes completed divided by the ideal number of lanes (18) in the test land area; judgment used when surveyors strayed from parallel.

Land Surveys with Headphones

Surveyor No.	Survey Duration (min)	Percent ^a Coverage	Per Surveyor			Per GIS Technician		
			No. Misses	No. Found	False Positives	No. Misses	No. Found	False Positives
1	21	83	1	9	0	1	9	0
2	12	56	1	9	0	1	9	0
3	35	83	0	10	0	0	10	1
4	31	83	0	10	0	0	10	0
5	20	89	1	9	0	0	10	3
6	18	67	2	8	0	2	8	1
7	26	72	2	8	0	2	8	0
8	35	94	1	9	0	0	10	0
9	22	83	0	10	0	0	10	1
10	28	94	0	10	0	0	10	0
Sums:	NA	NA	8	92	0	6	94	6
Averages:	25	81	0.8	9.2	0	0.6	9.4	0.6

^aPercent coverage generally based on the number of parallel survey lanes completed divided by the ideal number of lanes (18) in the test land area; judgment used when surveyors strayed from parallel.